

Twin Power Pentode

9-PIN MINIATURE TYPE
INTERNALLY NEUTRALIZED FOR PUSH-PULL AMPLIFIER SERVICE
14 WATTS CW INPUT (1CAS) UP TO 500 Mc

For Communications Equipment Operating at Frequencies up to 500 Mc as a Push-Pull RF-Power-Amplifier or as a Frequency-Multiplier Tube

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:

Heater arrangement	Series	Parallel	
Voltage (AC or DC)	12.6 $\pm$ 10%	6.3 $\pm$ 10%	volts
Current	0.3	0.6	amp

Transconductance (Each Unit)

for dc plate volts = 150, dc grid-No.2 volts = 150, and dc plate ma. = 25	10500	μ mhos
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Mu-Factor, Grid No.2 to Grid

No.1 (Each Unit) for dc plate volts = 150, dc grid No.2 volts = 150, and dc plate ma. = 25.	31	
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Direct Interelectrode Capacitances

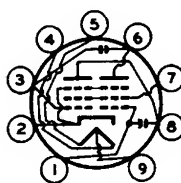
(Approx., Each Unit):^A

Grid No.1 to plate.	0.15	μ f
Grid No.1 to cathode & grid No.3, grid No.2, and heater.	6.4	μ f
Plate to cathode & grid No.3, grid No.2, and heater	1.6	μ f

Mechanical:

Operating Position.	Any
Maximum Overall Length.	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip).	2" $\pm$ 3/32"
Diameter.	0.750" to 0.875"
Dimensional Outline	See General Section
Bulb.	T6-1/2
Base.	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW.	9HL

Pin 1 - Grid No.1
of Unit No.2
Pin 2 - Cathode,
Grid No.3
Pin 3 - Grid No.1
of Unit No.1
Pin 4 - Heater



Pin 5 - Heater
Pin 6 - Plate of
Unit No.2
Pin 7 - Grid No.2
Pin 8 - Plate of
Unit No.1
Pin 9 - Heater Tap



PUSH-PULL RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[®]**PUSH-PULL RF POWER AMPLIFIER — Class C FM Telephony***Values are on a per-tube basis unless otherwise specified***Maximum Ratings, Absolute-Maximum Values:***Up to 500 Mc*

	CCS*	ICAS [†]	
DC PLATE VOLTAGE.	250 max.	250 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	200 max.	200 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-100 max.	-100 max.	volts
DC PLATE CURRENT.	90 max.	100 max.	ma
DC GRID-No.1 CURRENT.	6 max.	8 max.	ma
DC CATHODE CURRENT.	100 max.	120 max.	ma
PLATE INPUT	12 max.	14 max.	watts
GRID-No.2 INPUT	3 max.	3.5 max.	watts
GRID-No.1 INPUT	0.2 max.	0.24 max.	watt
PLATE DISSIPATION	6 max.	7.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode.	100 max.	100 max.	volts
Heater positive with respect to cathode.	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface).	225 max.	225 max.	°C

Typical Operation:*At 500 Mc*

DC Plate Voltage.	180	200	volts
DC Grid-No.2 Voltage.	180	200	volts
DC Grid-No.1 Voltage.	-20	-20	volts
From grid resistor for each grid No.1 of	27000	27000	ohms
Peak-to-Peak RF Grid-No.1 Voltage	50	50	volts
DC Plate Current.	55	60	ma
DC Grid-No.2 Current.	12.5	14	ma
DC Grid-No.1 Current.	1.5	1.5	ma
Driver Power Output (Approx.)	1.2	1.2	watts
Useful Power Output (Approx.)	5	6	watts



PLATE-MODULATED PUSH-PULL RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use
with a maximum modulation factor of 1

Values are on a per-tube basis

Maximum Ratings, Absolute-Maximum Values:

	Up to 500 Mc		
	CCS*	ICAS♦	
DC PLATE VOLTAGE.	200 max.	200 max.	volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE	200 max.	200 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-100 max.	-100 max.	volts
DC PLATE CURRENT.	64 max.	80 max.	ma
DC GRID-No.1 CURRENT.	6 max.	8 max.	ma
DC CATHODE CURRENT.	80 max.	96 max.	ma
PLATE INPUT	8 max.	10 max.	watts
GRID-No.2 INPUT	2 max.	2.3 max.	watts
GRID-No.1 INPUT	0.2 max.	0.24 max.	watt
PLATE DISSIPATION	4 max.	5 max.	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode.	100 max.	100 max.	volts
Heater positive with respect to cathode.	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface).	225 max.	225 max.	°C

Typical Operation:

	At 500 Mc		
	CCS*	ICAS♦	
DC Plate Voltage.	180	180	volts
DC Grid-No.2 Voltage.	180	180	volts
DC Grid-No.1 Voltage.	-20	-20	volts
From grid resistor for each grid No.1 of	68000	27000	ohms
Peak-to-Peak RF Grid-No.1 Voltage	45	50	volts
DC Plate Current.	40	55	ma
DC Grid-No.2 Current.	9.5	12.5	ma
DC Grid-No.1 Current.	0.6	1.5	ma
Driver Power Output (Approx.)	1	1.2	watts
Useful Power Output (Approx.)	3.5	5	watts

FREQUENCY TRIPLER — Class C

Values are on a per-tube basis

Maximum Ratings, Absolute-Maximum Values:

	Up to 500 Mc		
	CCS*	ICAS♦	
DC PLATE VOLTAGE.	250 max.	250 max.	volts



	CCS*	ICAS†	
DC GRID-No.2 (SCREEN-GRID)			
VOLTAGE	200 max.	200 max.	volts
DC GRID-No.1 (CONTROL-GRID)			
VOLTAGE	-100 max.	-100 max.	volts
DC PLATE CURRENT.	60 max.	80 max.	ma
DC GRID-No.1 CURRENT.	6 max.	8 max.	ma
DC CATHODE CURRENT.	70 max.	80 max.	ma
PLATE INPUT	8 max.	10 max.	watts
GRID-No.2 INPUT	3 max.	3.5 max.	watts
GRID-No.1 INPUT	0.2 max.	0.24 max.	watt
PLATE DISSIPATION	6 max.	7.5 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with			
respect to cathode.	100 max.	100 max.	volts
Heater positive with			
respect to cathode.	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest			
point on bulb surface).	225 max.	225 max.	°C

Typical Operation:

	<i>Up to 500 Mc</i>		
DC Plate Voltage.	180	200	volts
DC Grid-No.2 Voltage (Approx.).	180	190	volts
Through resistor of	1200	1200	ohms
DC Grid-No.1 Voltage.	-74	-74	volts
From grid resistor for			
each grid No.1 of	82000	82000	ohms
Peak-to-Peak RF			
Grid-No.1 Voltage	165	165	volts
DC Plate Current.	40	46	ma
DC Grid-No.2 Current.	9.7	11	ma
DC Grid-No.1 Current.	1.8	1.8	ma
Driver Power Output			
(Approx.)	1.1	1.1	watts
Useful Power Output			
(Approx.)‡.	1.8	2.2	watts

▲ Without external shield.

● Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

★ Continuous Commercial Service.

◆ Intermittent Commercial and Amateur Service.

‡ This value of useful power is measured at load of output circuit.

OPERATING CONSIDERATIONS

Shielding of the 6939 in "straight-through" rf-amplifier service may be required for stable operation. To minimize external feedback from the plate to grid No.1, a grounded shield crossing the terminal end of the tube socket through the space between pins 4 and 5 and the space between pins 1 and 9, is generally adequate for this purpose.



6939

The heater may be effectively bypassed by grounding one heater pin at the tube socket and bypassing the other heater pin to ground with a low inductance capacitor. If further isolation of the ungrounded heater pin is required a suitable rf choke followed by another low inductance bypass capacitor, is recommended.

The cathode of the 6939 should be grounded by means of the shortest possible connection to reduce the effect of cathode-lead inductance.

The rf impedance between grid No.2 and the cathode must be kept low, usually by means of a suitable bypass capacitor. In telephony service when grid No.2 is modulated, a smaller bypass capacitor than is used for telegraphy service may be required in order to avoid excessive af bypassing. However, if the capacitance value is too small, rf feedback may occur between plate and grid No.1, depending on the circuit layout, operating frequency, and power gain of the stage. AF bypassing difficulties can usually be eliminated if the grid-No.2 bypass capacitor is replaced by a series-resonant circuit which is tuned to resonate at the operating frequency. This circuit presents a high impedance to audio frequencies but a very low impedance to its resonant frequency.

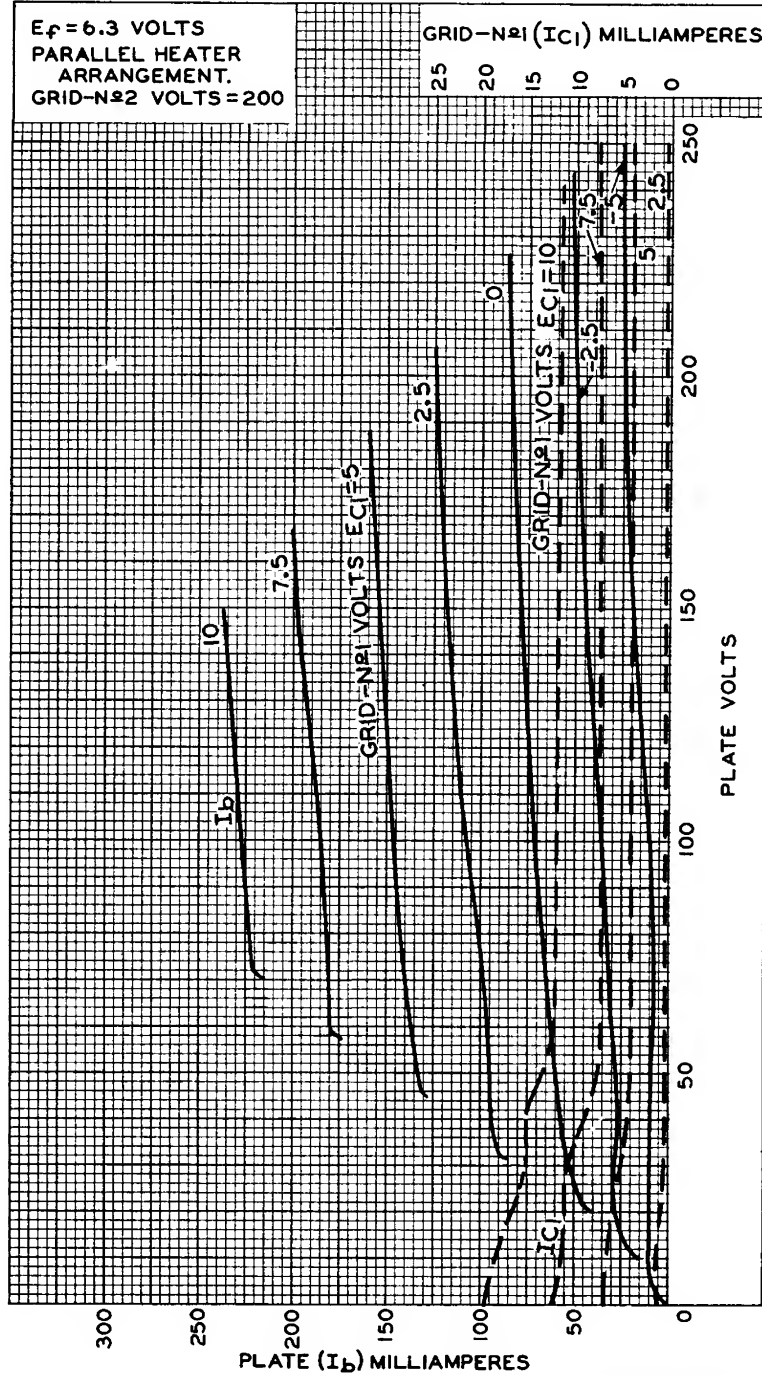
To prevent generation of parasitic oscillations, it is recommended that a 100-ohm resistor be connected in series with grid No.2 as close to the socket as possible.



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AVERAGE CHARACTERISTICS Each Unit



92CM-10613

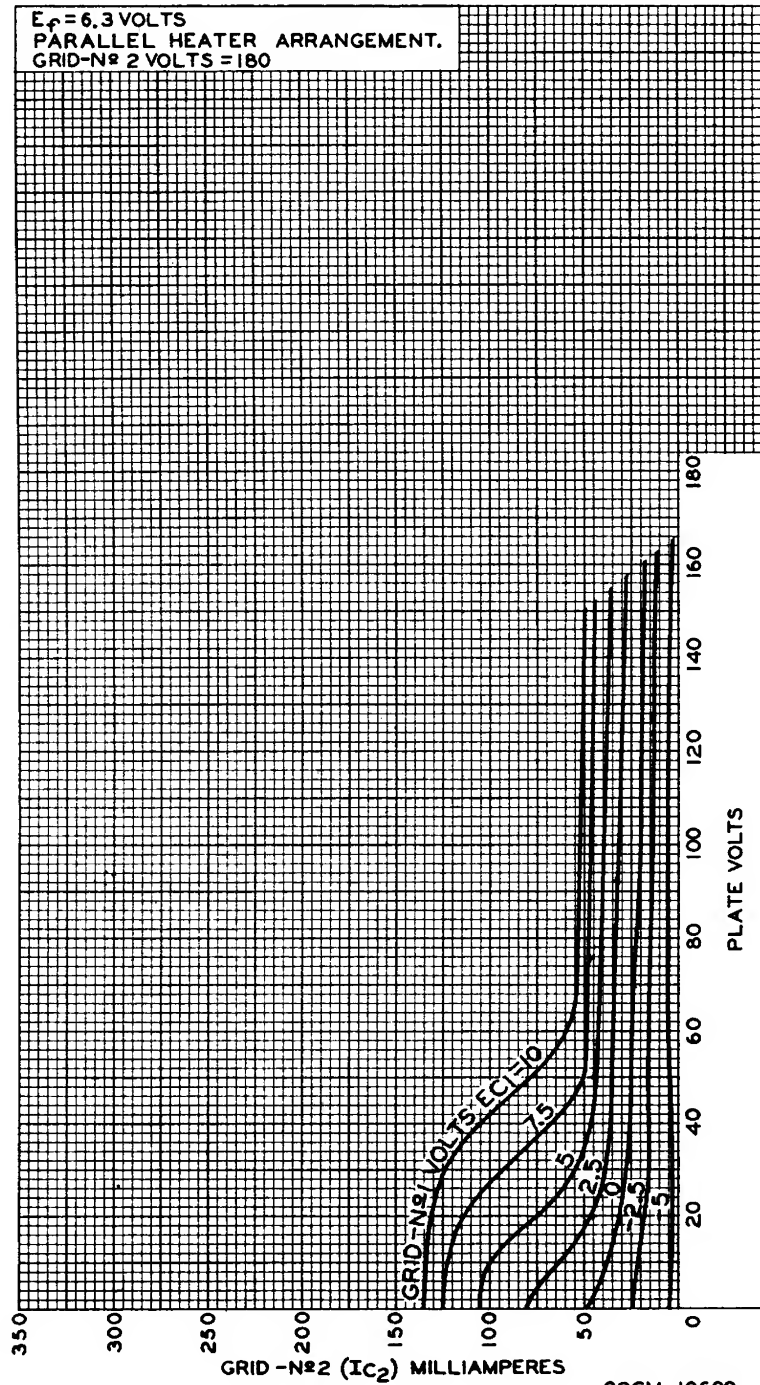


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DATA 4
10-60

6939

AVERAGE CHARACTERISTICS Each Unit



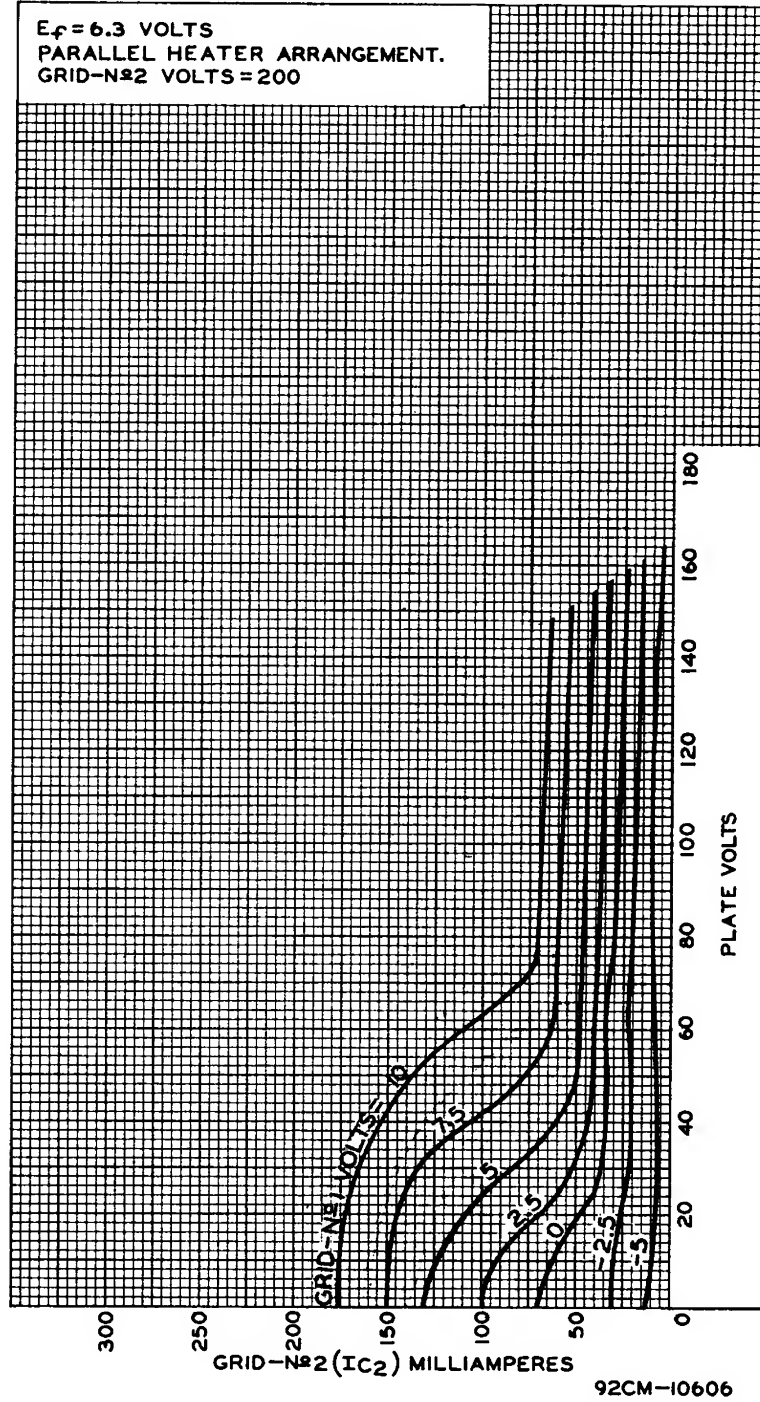
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AVERAGE CHARACTERISTICS Each Unit

$E_f = 6.3$ VOLTS
PARALLEL HEATER ARRANGEMENT.
GRID-N₂ VOLTS = 200



92CM-10606

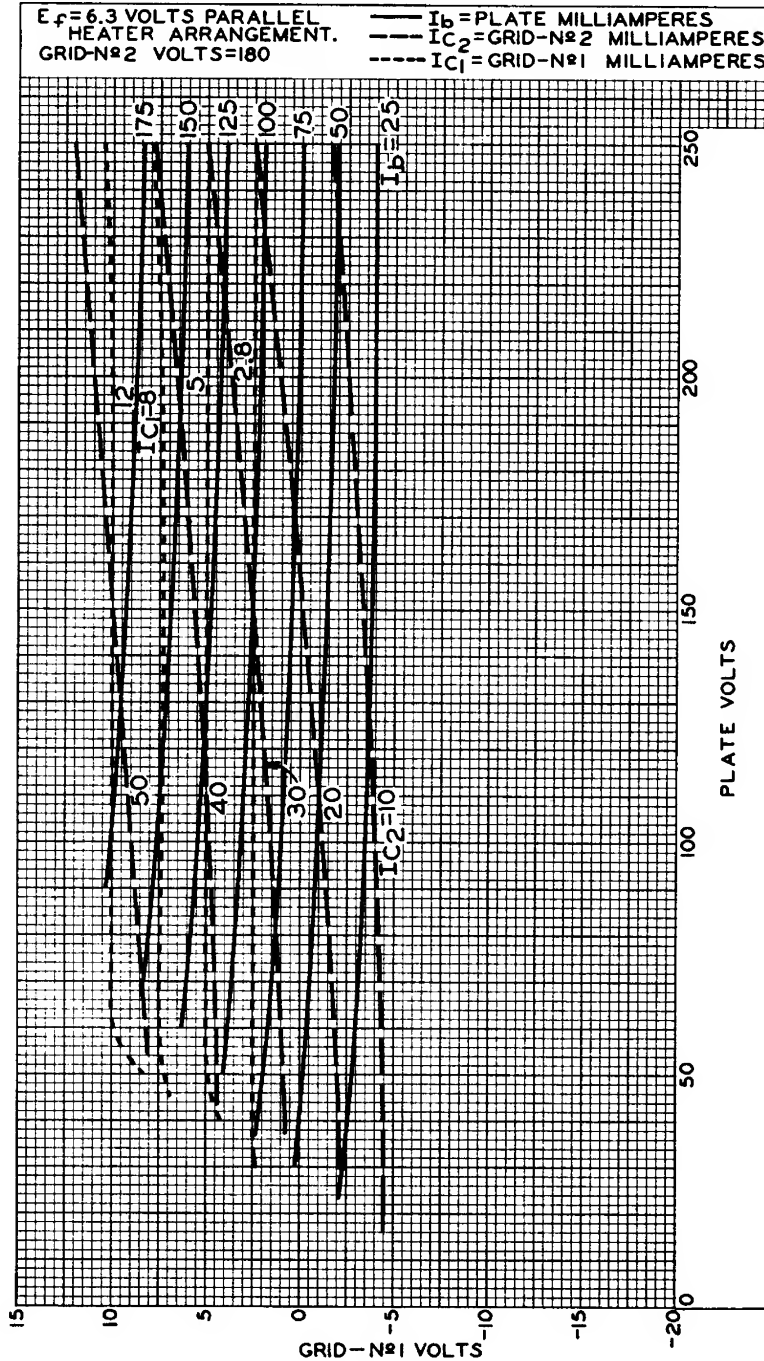


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DATA 5
10-60

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AVERAGE CONSTANT-CURRENT CHARACTERISTICS Each Unit



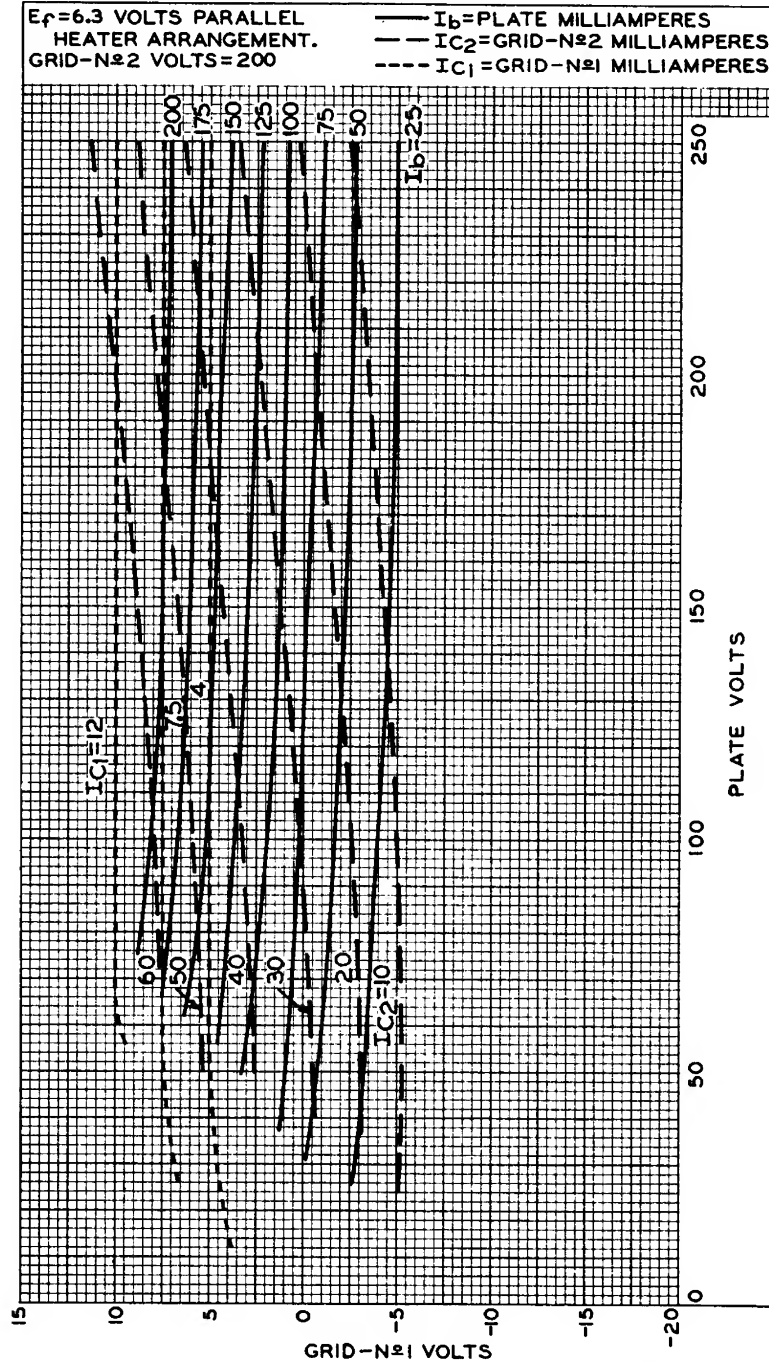
92CM-10608

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AVERAGE CONSTANT-CURRENT CHARACTERISTICS Each Unit



92CM-10603



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DATA 6
10-60